REMARKS

In response to the Official Action mailed June 25, 2002, Applicants amend their application and request reconsideration. In this Amendment, claim 1 is cancelled and claims 17 and 18 are added so that claims 2-4 and 6-18 are now pending.

In this Amendment, claims 2-4, 6-9, and 11-14 have been made dependent, directly or indirectly, from claim 15. Claim 10 has been made dependent on claim 16. Claim 17 is added to replace original claim 5 and claim 18 provides the same limitation to claim 16 that claim 17 provides to claim 15.

In terms of the embodiment of the invention illustrated in Figures 6(a) and 6(b), the flow rate measuring device of claims 15 and 16 includes a flow rate detector 31 having a substantially plate-shaped mounting member 32 extending along the fluid flow direction and substantially parallel to a longitudinal direction of the fluid introduction port. The advantages of this structure are described in the patent application from page 49, line 17 through page 50, line 17.

If the measuring duct gradually becomes smaller only in the longitudinal direction of the fluid flow passage and not transverse to the longitudinal direction, the cross-sectional shape of the measuring duct approaches a square shape in the downstream direction. This shape risks an increasing rotary energy within the fluid flow, producing vortexes as in prior art structures. The present invention avoids this problem by providing the mounting member in the specified orientation so that the measuring duct maintains a rectangular cross-sectional shape in the fluid flow direction, unlike the prior art structures. Further, the invention provides a novel combination of the specified passage shape and mounting member in the passage so that the fluid flow stream is divided and that vortexes in the fluid flow are effectively damped.

Prior art structures, such as those including a measuring duct that generally decreases in dimension in every direction transverse to the fluid flow. along the direction of fluid flow cause increased swirling speed, i.e., more and faster swirling vortexes with decreasing radii. In those structures the fluid flow streams are deflected toward the outer wall in a narrowing passage, increasing error in detection of the fluid flow.

Since, in the invention, the measuring duct narrows only in the longitudinal direction not in a transverse direction, the swirling streams that may enter the fluid introduction port cannot maintain the circularly rotating state. Instead, the swirling streams of fluid flow are divided into a plurality of vortexes that have a common rotary direction. Since adjacent vortexes then have flows in opposite directions where the vortexes are tangent to each other, the rotary energy is damped. Therefore, errors in fluid flow measurements are reduced in the invention as compared to the prior art structures that do not damp swirling in the fluid flow.

All of the previously examined claims were rejected as unpatentable over the prior art described in the patent application in combination with Shockley (U.S. Patent 2,509,889) and over the prior art described in the patent application in view of Bonne (U.S. Patent 5,249,462). These rejections are respectfully traversed.

While extended discussion could be provided concerning both of these rejections, neither the prior art described in the patent application with respect to Figures 39-45 nor either of Shockley and Bonne disclose a flow rate detector having the structure specified in the final paragraphs of claims 15 and 16, the two remaining independent claims. Therefore, no combination of those sources of prior art could establish *prima facie* obviousness as to any pending claim.

Reconsideration and allowance of all claims now pending are appropriate and earnestly solicited.

Respectfully submitted,

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Date: November 22, 2002
JAW:ves

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PATENT & TRADEMARK OFFICE

PATENT
Attorney Docket No. 400388/TSI

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

HAMADA et al.

Application No. 09/425,630 Art Unit: 2855

Filed: October 22, 1999 Examiner: C. Dickens

For: FLOW RATE MEASURING DEVICE

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AMENDMENTS TO CLAIMS MADE IN RESPONSE TO OFFICE ACTION DATED JUNE 25, 2002

Amendments to existing claims:

Cancel claim 1.

2. (Twice Amended) The device according to Claim ~~1~~ 15, wherein the measuring duct extends substantially linearly in a direction from an upstream side of the fluid passage toward a downstream side of the fluid passage.

3. (Thrice Amended) The device according to Claim ~~1~~ 15, wherein the fluid introduction port has a length in the longitudinal direction and a width in a transverse direction, transverse to the longitudinal direction, the longitudinal length being at least twice the width.

4. (Thrice Amended) The device according to Claim ~~1~~ 15, wherein the measuring duct includes a second pair of generally smooth converging inner wall surfaces, generally transverse to the first pair of inner wall surfaces, narrowing in the downstream direction, and having a curved profile in a plane perpendicular to the fluid introduction port and parallel to a longitudinal direction of the fluid introduction port.

6. (Twice Amended) The device according to Claim ~~1~~ 15, wherein the measuring duct ~~is~~ narrows to at least a position where an upstream end of the flow rate detector is located.

7. (Thrice Amended) The device according to Claim ~~1~~ 15, wherein the measuring duct narrows to at least a position where a flow rate detecting element of the flow rate detector is located.

8. (Thrice Amended) The device according to Claim ~~1~~ 15, wherein the fluid introduction port has, in a plane perpendicular to the fluid flow, a closed curve shape.

9. (Thrice Amended) The device according to Claim ~~1~~ 15, wherein the measuring duct has a second pair of inner wall surfaces, generally transverse to the first pair of inner wall surfaces, and extending from a location upstream of the flow rate detector to the flow rate detector and narrowing toward the downstream direction, in a transverse direction of the fluid introduction port.

10. (Thrice Amended) The device according to Claim ~~1~~ 16, wherein the measuring duct includes a notch at the single hole.

11. (Thrice Amended) The device according to Claim ~~1~~ 15, wherein the measuring duct includes an outer wall surface that, at least in part, extends outwardly.

12. (Thrice Amended) The device according to Claim ~~1~~ 15, including projections located on the duct near the fluid introduction port and extending in an upstream direction.

14. (Twice Amended) The device according to Claim ~~1~~ 15, wherein the post extends into the fluid passage through an opening in a side wall of the fluid passage.

15. (Twice Amended) A flow rate measuring device comprising:

a post located in a fluid passage for passing a fluid flow and extending across a part of the fluid flow;

a measuring duct in the post, the measuring duct ~~having~~ including

a fluid introduction port with an elongated shape confronting a flow direction of the fluid flow, and

a first pair of generally smooth, converging inner wall surfaces, narrowing toward a downstream direction of the fluid flow, each of the smooth inner wall surfaces having a profile, in a cross-section parallel to the fluid flow direction and to the post, ~~including an inflection point~~; and

a flow rate detector located in the measuring duct and comprising a substantially plate-shaped mounting member extending along the fluid flow, substantially parallel to a longitudinal direction of the fluid introduction port, and a flow rate detection element on a main surface of the mounting member.

16. (Thrice Amended) A flow rate measuring device comprising:

a post located in a fluid passage for passing a fluid flow and extending across a part of the fluid flow;

a measuring duct in the post, the measuring duct ~~having~~ including

a fluid introduction port with an elongated shape confronting a flow direction of the fluid flow and,

a ~~first~~ pair of generally smooth, converging inner wall surfaces, narrowing toward a downstream direction of the fluid flow, each of the smooth inner wall surfaces having a profile, in a cross-section parallel to the fluid flow direction and to the post, ~~including an inflection point~~, and

a single hole downstream of the fluid introduction port for exiting of the fluid flow from the measuring duct; and

a flow rate detector located in the measuring duct and comprising a substantially plate-shaped mounting member extending along the fluid flow, substantially parallel to a longitudinal direction of the fluid introduction port, and a flow rate detection element on a main surface of the mounting member.